

CLAIMS

1. A bending action member comprising:

a movable means in which the front end side portion thereof is bendable;

a drive power transmitting means capable of transmitting a drive power to the movable means;

a member accommodating means that is connected to the movable means and contains a hollow portion accommodating the drive power transmitting means; and

an air-tight member provided in the hollow portion.

2. The bending action member according to claim 1 wherein the air-tight member makes a sliding contact with the drive power transmitting means when the drive power is transmitted to the movable means by the drive power transmitting means.

3. The bending action member according to claim 1 or 2 wherein the movable means is constituted of a plurality of articulation portions and adjoining two articulation portions of the plurality of the articulation portions are so constructed that the articulation portion on the rear end side starts its bending action after the bending of the articulation portion on the front end side ends.

4. The bending action member according to any one of claims 1 to 3 wherein a pair of forceps members constructed that at least one of them is rotatable is provided at the front end of the movable means and

the pair of the forceps members is capable of gripping a solid object corresponding to a drive power transmitted by the drive power transmitting means.

5. A manipulator comprising:

a movable means in which the front side portion thereof is bendable;

a drive power generating means capable of generating a drive power for operating the movable means;

a drive power transmitting means capable of transmitting a drive power generated by the drive power generating means to the movable means;

a member accommodating means that is connected to the movable means and contains a hollow portion accommodating the drive power transmitting means; and

an air-tight member provided in the hollow portion.

6. The manipulator according to claim 5 wherein the air-tight member makes a sliding contact with the drive power transmitting means when the drive power is transmitted to the movable means by the drive power transmitting means.

7. The manipulator according to claim 5 or 6 wherein the movable means is constituted of a plurality of articulation portions and adjoining two articulation portions of the plurality of the articulation portions are so constructed that the articulation portion on the rear end side does not start its bending action until the bending of the articulation portion on the front end side ends.

8. The manipulator according to any one of claims 5 to 7 wherein a pair of forceps members constructed that at least one of them is rotatable is provided at the front end of the movable means and

the pair of the forceps members grips a solid object by transmitting a drive power generated by the drive power generating means with the drive power transmitting means.

9. A multi-slider linkage mechanism further comprising a movable means having a plurality of articulations and constructed to be bendable, wherein the first articulation portion on the front end side and the second articulation portion on the rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that the bending action at the second articulation portion starts after the bending action at the first articulation portion ends,

and the magnitude of a moment required for starting the bending action of the second articulation portion is larger than a moment required for the bending action of the first articulation portion.

10. The multi-slider linkage mechanism according to claim 9, wherein

the second articulation portion has a rotary shaft perpendicular to the bending direction of the bending action,

and a first frame member and a second frame member having a common rotary shaft and constituting the second articulation portion are so constructed that

the first frame member has a first coupling portion;

the second frame member has a second joint portion;

the first coupling portion and the second coupling portion are jointed with the rotary shaft used in common;

and a force generated in the direction along the rotary shaft is increased between the first coupling portion and the second coupling portion accompanied by the bending action of the second articulation portion.

11. The multi-slider linkage mechanism according to claim 10 wherein the contact face of the first coupling portion with the second coupling portion and the contact face of the second coupling portion with the first coupling portion are tapered forward so that the

respective contact faces follow each other when it is not bent.

12. A bending action member comprising:

a movable means having a plurality of articulation portions at its front end side portion and constructed to be bendable;

and a drive power transmitting means constructed to be capable of transmitting the drive power to the movable means, wherein

the first articulation portion on the front end side and the second articulation portion on the rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that the bending action at the second articulation portion starts after the bending action at the first articulation portion ends, and

the magnitude of a moment required for starting the bending action of the second articulation portion is larger than a moment required for the bending action of the first articulation portion.

13. A manipulator comprising:

a movable means having a plurality of articulation portions at its front end portion and constructed to be bendable;

a drive power generating means constructed to be

capable of generating a drive power for operating the movable means; and

a drive power transmitting means constructed to be capable of transmitting the drive power generated by the drive power generating means to the movable means, wherein

the first articulation portion on the front end side and the second articulation portion on the rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that the bending action at the second articulation portion starts after the bending action at the first articulation portion ends, and

the magnitude of a moment required for starting the bending action of the second articulation portion is larger than a moment required for the bending action of the first articulation portion.

14. The manipulator according to claim 13, wherein a pair of forceps members constructed that at least one of them is rotatable is provided at the front end of the movable means and

the pair of the forceps members is capable of gripping a solid object by transmitting a drive power generated by the drive power generating means with the drive power transmitting means.

15. A bending action member comprising:

a movable means constructed that its front end side portion is bendable; and

a drive power transmitting means constructed of at least one link member capable of transmitting a drive power to the movable means, wherein

a first joint portion is constructed of an end on an opposite side to the front end side of the link member, and

the first joint portion is constructed to be connectable with a drive power generating means for generating the drive power and the drive power transmitting means is so constructed to be capable of transmitting the drive power from the drive power generating means to the movable means.

16. The bending action member according to claim 15, wherein

the movable means has a plurality of articulations, and

the first articulation portion on the front end side and the second articulation portion on the rear end side that are constructed to be bendable to the same side and adjoin each other of the plurality of the articulation portions are so constructed that the bending action at the second articulation portion starts after the bending action at the first articulation portion ends.

17. The bending action member according to claim 15 or 16, wherein

the first joint portion has a projecting portion, and

the projecting portion is capable of being fitted to a fitting hole made in a second joint portion composed of elastic body that has the fitting hole and urges substantially perpendicularly to the transmitting direction of the drive power.

18. An actuator constructed to be capable of engaging/disengaging a bending action member provided with a movable means at its front end side portion and having a first joint portion, and comprising a drive power generating means capable of generating a drive power for operating the movable means, wherein

the drive power generating means having a second joint portion containing an elastic body for urging substantially perpendicularly to the transmitting direction of the drive power and having a fitting hole,

the second joint portion is connectable with the first joint portion by advancing substantially linearly along the direction of the drive power and fitting the fitting hole to a projecting portion while applying an urging force by the elastic body to the first joint portion having the projecting portion capable of being fitted

to the fitting hole.

19. A manipulator comprising:

a bending action member including a movable means constructed that its front end side portion is bendable and a drive power transmitting means capable of transmitting a drive power applied from outside to the movable means; and

an actuator having a drive power generating means capable of generating a drive power for operating the movable means, wherein

the bending action member and the actuator are constructed to be capable of engaging/disengaging each other; the first joint portion provided on the drive power transmitting means and the second joint portion provided on the drive power generating means are provided to be connectable and separable;

the coupling between the first joint portion and the second joint portion is executed after the bending action member and the actuator are jointed together; and

the first joint portion and the second joint portion are separated accompanied by the separating action of the bending action member and the actuator.

20. The manipulator according to claim 19, wherein

the second joint portion has an elastic body containing a fitting hole and for urging substantially

perpendicularly to the transmitting direction of the drive power;

the first joint portion includes a projecting portion capable of being fitted to the fitting hole; and

the second joint portion is advanced substantially linearly along the transmitting direction of the drive power by the drive power generating means and fitted to the fitting hole while generating the urging force to the projecting portion, so that the first joint portion and the second joint portion are coupled to connect the drive power transmitting means with the drive power generating means.